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A marine vertebrate fauna from the Late Triassic of Somerset, and a review of British placodonts

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ABSTRACT

The British Rhaetian (latest Triassic) is famous for its bone beds containing abundant remains of fishes and reptiles. Most Rhaetian bone beds are assumed to have been similar in faunal composition, representing long-distance mixing of transported remains, and deposition some distance from shore. In the Mendip Hills of southwest England, some Rhaetian bone beds lie unconformably on Carboniferous Limestone, where the marine sediments of the Rhaetian Transgression lapped onto the shorelines of the palaeo-islands. The fauna from the Marston Road site, near Holwell, Shepton Mallet, in Somerset, shows a remarkable association of some coastal and terrestrial reptile remains mixed with the usual teeth and scales of sharks and bony fishes. We report unequivocal fossils of a small lepidosaur, probably a sphenodontian, a terrestrial wash-in, as well as marine reptiles, the possible thalattosaur *Pachystropheus* and placodonts. Sphenodontian remains are abundant in Late Triassic red bed fissure fills from nearby, and the Marston Road site provides a palaeoecological/topographic link between terrestrial and marine deposits, hinting also that the development of some of the vertebrate-bearing fissures may have been coeval with the Rhaetian transgression.

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1. Introduction

The Rhaetian transgression (latest Triassic) extended across much of Europe (Hallam, 1997), including the United Kingdom (e.g. Storrs, 1994; Swift and Martill, 1999), ending a long period of semi-arid climate with lacustrine and evaporitic sedimentation in a broadly coastal sabhka environment. Occasional storms brought in coarse materials that formed thin horizons of sandstone in the black shales of the Westbury Formation of the Penarth Group (Kent, 1968; MacQuaker, 1987, 1999; Allington-Jones et al., 2010). These horizons include bone beds that contain abundant remains of fossil vertebrates including chondrichthyans, actinopterygians and marine reptiles such as ichthyosaurs and plesiosaurs (e.g. Moore, 1881; Richardson, 1909, 1911; Duffin, 1980; Swift and Martill, 1999; Storrs, 1994).

In the Mendip Hills, the Bristol area and South Wales, folded Palaeozoic rocks represented topographic highs that were not completely submerged by the Rhaetian transgression, but persisted above sea level forming an archipelago of limestone

islands (Fig. 3) (Robinson, 1957; Whiteside and Marshall, 2008). Karstic weathering and tectonic activity created fissures in the limestone, which were infilled with sediment. These infills have attracted a great deal of interest since they have yielded remains of early mammals and dinosaurs, such as *Haramiya* and *Thecodontosaurus* respectively (Moore, 1881; Richardson, 1911; Kühne, 1947; Whiteside and Marshall, 2008; van den Berg et al., 2012; Foffa et al., 2014). Dating of the fissures has been problematic, with many being Rhaetian in age, others perhaps older and some younger (Kühne, 1947; Robinson, 1957; Whiteside and Marshall, 2008). In general the faunas of vertebrate-bearing fissures, having formed on the tops of islands, are quite distinct from those of marine, vertebrate-bearing Rhaetian bone beds.

It is uncommon to find a close association between the bedded, marine Rhaetian, especially the Westbury Formation, with its classic phosphatic bone beds, and the terrestrial fissures, of similar age, that formed on the palaeo-islands, and yet one such site is the 'Marston Road Quarry', first reported by Charles Moore (1867) in his initial overview of the Rhaetian bone beds and fissures around Bristol, and again by Richardson (1909, 1911). The site was mentioned by Kühne (1947, p. 729), in his account of the sedimentology and palaeontology of the nearby Holwell fissure

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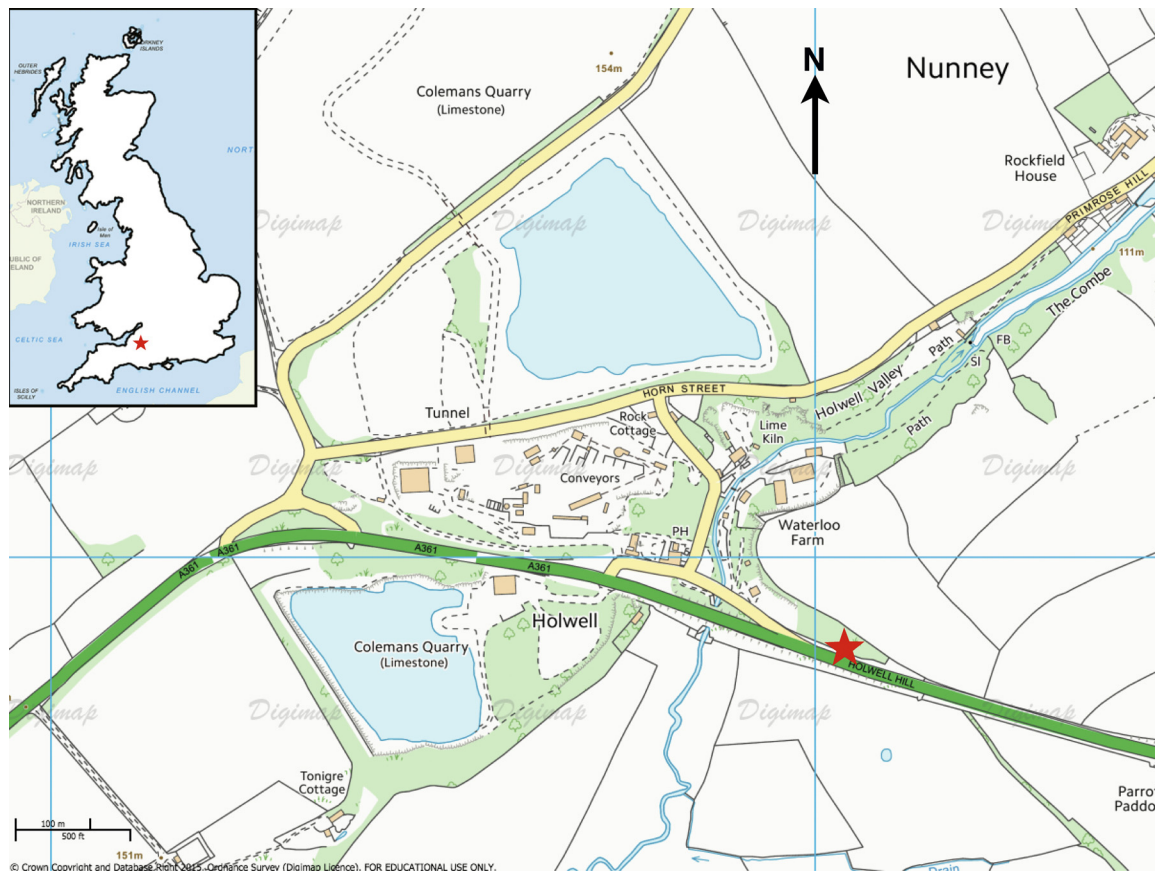


Fig. 1. Map of the Marston Road locality, with the Marston Road Quarry marked with a red star. © Crown Copyright and Database Right 2015. Ordnance Survey (Digimap Licence).

fillings (Fig. 1) and their important early mammal specimens. He reported that Simpson (1928) had dated the Holwell mammals as lower Rhaetian on the basis of the invertebrate fauna recorded by Richardson (1911) from the Marston Road Quarry, 'about 300 yards east of Moore's "Microlestes Quarry", on the other side of the Holwell valley'. Kühne (1947) discounted this dating evidence because it is impossible to be sure that the fissure and the bedded Rhaetian were of the same age. Nonetheless, the references to the site were intriguing, and we relocated the locality in 2014, on the north side of the A361 road that runs from Frome to Shepton Mallet in Somerset (UK National Grid Reference ST 73114485). Its current state is disappointing, the available outcrop being much reduced in size and almost entirely overgrown. Nonetheless, we located photographs, drawings, and unpublished notes reporting excavations by local geologists Mike Curtis, Charlie Copp and others made during the period 1981–1985. Very little was published of that work, other than a short field description (Copp, 1985), and since then the A361 road has been widened and partly extended over the site of the quarry, so obscuring it for ever. Further, Curtis made substantial collections from the Rhaetian bone bed at this site, comprising 4497 specimens in all, and his collections are available for study, being lodged in Bristol City Museum (BRSMG) and the University of Bristol School of Earth Sciences (BRSUG).

Rhaetian marine vertebrate faunas are generally assumed to have been rather uniform from site to site, presumably reflecting the influence of a single, substantial transgressive event that swept rapidly over the whole of England. Nonetheless, it might be of interest to compare vertebrate faunas from those parts of the Rhaetian that overlie Triassic, and those that accumulated as

thinner overlap sequences directly on the margins of the Carboniferous palaeo-islands of the Mendips. Although several studies have investigated the terrestrial fauna from the fissures at Holwell (Kühne, 1947; Copp, 1980; Duffin, 1980), few studies have been undertaken to reconstruct the marine Rhaetian fauna in the Mendip Hills. Whilst differences in invertebrate faunas have been noted in the Westbury Formation (Kent, 1968, 1970), it is generally assumed that the vertebrate fauna shows little or no variation in composition (cf. Sykes, 1971). However, one difference is in the presence or absence of placodonts, marine, shell-crushing reptiles, that have hitherto been described only from Holwell and Aust Cliff (Storrs, 1999); in this paper, we present a new occurrence record from Marston Road. Placodonts were turtle-like, armoured reptiles inhabiting shallow waters in the European epicontinental sea and on the margins of the eastern and western province of the Tethys. They originated in the Early Triassic, probably in Europe (Neenan et al., 2013), diversified through the Mid-Triassic, and became extinct at the end of the Triassic period (Pinna and Mazin, 1993b). They are some of the only reptiles known to have developed a durophagous feeding habit, using their flat, crushing teeth to feed on hard shelled invertebrates such as bivalves and gastropods (Pinna and Mazin, 1993b; Pinna, 1980; Pinna and Nosotti, 1989; Scheyer et al., 2012). The British material consists of isolated teeth and osteoderms, and they are relatively rare (Duffin, 1980). With no articulated specimens, teeth and osteoderms have previously been assigned to two different genera based on morphology; *Psephoderma* and *Placochelys*. However, Duffin (1980, p. 161) concluded that "it is most unlikely that a toothless *Psephoderma* and an unarmoured *Placochelyanus* lived side by side in the British Rhaetian sea", and

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